

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-025085

(43)Date of publication of application : 26.01.2001

(51)Int.Cl.

H04R 5/02  
H04S 7/00

(21)Application number : 11-194798

(71)Applicant : TOSHIBA CORP

(22)Date of filing : 08.07.1999

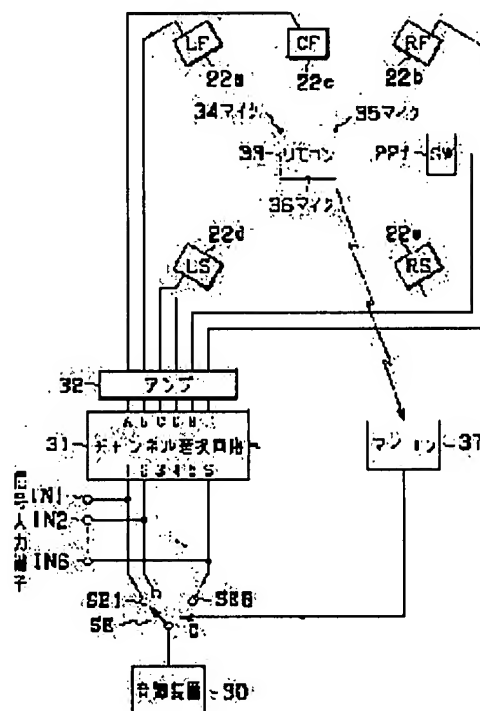
(72)Inventor : MAEDA MASAICHIRO

## (54) CHANNEL ARRANGING DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To simplify setting and connection of a speaker.

**SOLUTION:** A microcomputer 37 successively supplies test signals from a sound source device 30 through a selector SE and a channel selecting circuit 31 to speakers 22a-22f. The acoustic of test signal is collected by microphones 34-36 of a remote controller 33 and the kind and position of the speaker are discriminated. On the basis of the discriminated result, the microcomputer 37 issues an alarm for arranging the speaker at the proper position, controls the channel selecting circuit 31 and supplies the inputted regenerative signals of Dolby digital 5.1 ch to the proper speaker.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's  
decision of rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

## DETAILED DESCRIPTION

---

### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the suitable channel arrangement equipment for what reproduces acoustic signals of two or more channels, such as digital television broadcast, an AV amplifier, and a DVD player.

[0002]

[Description of the Prior Art] While enjoying an image and voice to coincidence conventionally, in order to acquire the comprehensive effectiveness, the sound field which are full of presence are demanded. For this reason, at the theater, the DORUBI digital (trademark) method, the DTS (digital theater system) method, etc. are introduced. In recent years, a DORUBI digital method has come to be adopted also in a home AV equipment.

[0003] It is the digital application of a Dolby surround system, and DORUBI digital 5.1ch prepares one pin center, large loudspeaker (CF) between two stereo loudspeakers (LF, RF) of front right and left, also back arranges two stereo loudspeakers (LS, RS), and is the system equipped with one loudspeaker (SW) for subwoofer only for low-pass components called LFE (Low Frequency Effect) further.

[0004] In DORUBI digital, such as DVD, the subwoofer (SW) which are the data for five channels corresponding to these five loudspeakers (LF, RF, CF, LS, RS) and data corresponding to the loudspeaker for low-pass (SW), respectively is recorded. Since subwoofer is low-pass, it considers as 0.1 channels and DORUBI digital 5.1ch is constituted by the data of these 5.1 Channel.

[0005] Drawing 17 is the block diagram showing an example of such a digital audio system, and shows the DVD audio system of the mold corresponding to DORUBI digital 5.1ch.

[0006] The DVD player 1 supports DORUBI digital 5.1ch, and has the analog output of six channels. A digital disposal circuit 4 performs predetermined signal processing to the DORUBI digital 5.1ch signal read in the disk 3 of DVD specification, and outputs it to the DORUBI digital decoder 5. The DORUBI digital decoder 5 decodes the inputted regenerative signal, and outputs a decoding signal to the configuration filter 7.

[0007] By addition of LFE, the configuration filter 7 acquires the signals LF, RF, CF, LS, RS, and SW of 5.1ch, and outputs them to a digital-to-analog converter (DAC) 6. The output of the configuration filter 7 is changed into an analog signal by DAC6, and is outputted as an output of the DVD player 1.

[0008] In addition, the microcomputer 2 is controlling actuation of a digital disposal circuit 4, the DORUBI digital decoder 5, and the configuration filter 7 based on the information on the key input section 8 or a disk 3.

[0009] After the output of 5.1 Channel from the DVD player 1 is amplified with amplifier 18, it is supplied to six loudspeaker 22a thru/or 22f. Ahead of the room 22, loudspeaker LF22a, RF22b, and CF22c are arranged, back loudspeaker LS22d and RS22e are arranged, and loudspeaker SW22f is arranged in the side. Sound output is carried out [ sound / of DORUBI digital 5.1ch / playback ] by these loudspeaker 22a thru/or 22f.

[0010] Thus, with the equipment mentioned above, six loudspeakers can be arranged suitably indoors

and the sound field which are full of presence can be built by supplying the signal corresponding to these loudspeakers.

[0011] However, in order to build the optimal playback environment, it not only arranges six loudspeakers suitable for the interior of a room, but a user needs to make complicated connection between the output terminal of equipment, and a loudspeaker. For ordinary users, installation was very difficult by the complicatedness of connection and a setup.

[0012] In addition, although the equipment which sets up the level of prime equipment etc. automatically in the sound system equipped with two or more loudspeakers was indicated by JP,6-38300,A, also in this equipment, the user needed to judge the installation condition of each loudspeaker, the connection with equipment, etc. to it, they needed to work to it by themselves, and there was same problem in it.

[0013]

[Problem(s) to be Solved by the Invention] Thus, there was a trouble that the connection and a setup for building the optimal playback environment conventionally were very complicated.

[0014] This invention is made in view of this trouble, and it aims at offering the channel arrangement equipment which can simplify connection and a setup.

[0015]

[Means for Solving the Problem] Two or more loudspeakers to which the channel arrangement equipment concerning this invention corresponded to the input signal of two or more channels, respectively, A channel selection means to make said two or more input terminals into which two or more input signals of a channel are inputted, respectively and said two or more loudspeakers correspond to 1 to 1, A sound-collecting means to collect the sound which said two or more loudspeakers outputted, and to output a sound-collecting signal, Give said test signal to said two or more loudspeakers one by one, and arrangement of two or more of said loudspeakers is judged with said sound-collecting signal from each loudspeaker to be a sound-source means to generate a test signal. While notifying whether said two or more loudspeakers are arranged in the location of normal based on a judgment result, said channel selection means is controlled and said control means which makes two or more input signals of a channel supply to said two or more loudspeakers is provided.

[0016] A control means gives the test signal by the sound-source means to each loudspeaker one by one, and makes sound output in this invention. Furthermore, a control means judges arrangement of two or more loudspeakers, and it controls a channel selection means by the sound-collecting signal based on the test signal by the sound-collecting means while it notifies whether two or more loudspeakers are arranged in the location of normal based on the judgment result. Thereby, the input signal of two or more channels is automatically supplied to each corresponding loudspeaker.

[0017]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing. Drawing 1 is the block diagram showing the gestalt of 1 operation of the channel arrangement equipment concerning this invention.

[0018] The gestalt of this operation supplies a test signal to each of two or more loudspeakers one by one, and it carries out sound reception with a microphone (henceforth a microphone), and while optimizing connection of a signal input and a loudspeaker automatically by the sound reception result, it makes it possible to notify an effective setup of a loudspeaker, and makes it possible to build the optimal playback environment by easy actuation.

[0019] signal input terminal IN1 Or IN6 \*\*\*\* -- each signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are inputted, respectively. For example, these signals are the same as that of what was outputted from the DVD player 1 of drawing 17 . Signal input terminal IN1 Or IN6 It connects with each input edge 1 of the channel selection circuitry 31 thru/or 6, respectively.

[0020] Each input edge 1 of the channel selection circuitry 31 thru/or 6 are connected also to sound-source equipment 30 through Selector SE. Sound-source equipment 30 outputs a predetermined test signal to the common edge C of Selector SE. Selector SE is an outgoing end SE 1. Or SE6 It is an outgoing end SE 1 about the test signal which has, was controlled by the microcomputer (henceforth a

microcomputer) 37 and was inputted into the common edge C. Or SE6 It outputs alternatively from one. [0021] Outgoing end SE 1 of Selector SE Or SE6 It connects with the input edge 1 of the channel selection circuitry 31 thru/or 6, respectively. The channel selection circuitry 31 has six outgoing ends A and E, can be controlled by the microcomputer 37, and can connect now the input edge 1 thru/or 6 and outgoing ends A and E to arbitration by 1 to 1.

[0022] The signal outputted from the outgoing ends A and E of the channel selection circuitry 31 is connected to six input edges of amplifier 32. Amplifier 32 amplifies the inputted signal and outputs it from six outgoing ends. Six outgoing ends of amplifier 32 are connected to loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f, respectively.

[0023] Loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f are the right-and-left front loudspeakers, the central front loudspeakers, right-and-left back loudspeakers, and subwoofer loudspeakers of DORUBI digital 5.1ch. Loudspeaker LF22a, RF22b, and CF22c are arranged among these loudspeakers in the front left, the indoor front right, and the indoor center of the front which are not illustrated, respectively, loudspeaker LS22d and RS22e are arranged on the indoor back left and the indoor back right, and loudspeaker SW22f is arranged in an indoor proper location.

[0024] In the gestalt of this operation, sound reception of loudspeaker 22a thru/or the 22f sound output is carried out with a microphone, a sound reception result is transmitted to a microcomputer 37, and Selector SE and the channel selection circuitry 31 are controlled. That is, a microcomputer 37 judges the right connection between a signal input and a loudspeaker in the proper location and class list of a loudspeaker by supplying the test signal from sound-source equipment 30 to loudspeaker 22a thru/or 22f with a sequential change at the time of a setup and connection decision of a loudspeaker, and carrying out sound output to all loudspeaker 22a thru/or 22f independently, respectively. And in order to mitigate complicatedness, such as wiring, on the occasion of transmission of the sound reception result of a microphone, in the gestalt of this operation, a microphone is added to remote control equipments (henceforth remote control), such as sound-source equipment 30 or a DVD player which is not illustrated, and it uses for them.

[0025] At the time of a setup and connection decision of a loudspeaker, remote control 33 is arranged in loudspeaker 22a thru/or the 22f center of \*\*\*\*. The sound reception section which microphones 34 and 35 do not illustrate, respectively is turned ahead, and it is attached in front end right and left of remote control 33, and the sound reception section which a microphone 36 does not illustrate is back turned in the center of the back end, and it is attached in it.

[0026] Drawing 2 is the block diagram showing the configuration of a processing block of such remote control 33.

[0027] In drawing 2, the microphones 34 and 35 of front end right and left and the microphone 36 of the center of the back end carry out sound reception of the output sound from each loudspeaker, change it into an electrical signal, and are supplied to amplifier 41 thru/or 43, respectively. Amplifier 41 thru/or 43 amplify the inputted signal, and outputs it to a rectifier 44 thru/or 46, respectively. A rectifier 44 thru/or 46 rectify the inputted signal, and outputs it to the electrical-potential-difference comparator circuit 47.

[0028] The electrical-potential-difference comparator circuit 47 compares a microphone 34 the rectifier 44 corresponding to the output of 36 thru/or the output voltage level of 46, and outputs a comparison result to the direction judging circuit 48. As mentioned above, at the time of a setup and connection decision of a loudspeaker, sound output of each loudspeaker is carried out independently. The direction judging circuit 48 judges the direction and distance over remote control 33 of the loudspeaker which is carrying out sound output while judging whether sound is outputted from which loudspeaker based on the comparison result of a voltage level. In addition, the electrical-potential-difference comparator circuit 47 can also detect now the frequency characteristics of a microphone 34 thru/or the sound reception signal of 36. Thereby, subwoofer (SW) and the other loudspeaker are discriminable.

[0029] The direction judging circuit 48 outputs a judgment result to a sending circuit 49. A sending circuit 49 transmits the inputted judgment result with infrared radiation. A microcomputer 37 has an infrared light sensing portion, and incorporates the judgment result of the direction judging circuit 48

outputted from the sending circuit 49. At the time of a setup and the connection decision of a loudspeaker, the display which does not illustrate the notice about proper arrangement of a loudspeaker performs it while a microcomputer 37 judges the right connection between a signal input edge and each loudspeaker based on the judgment result of the direction judging circuit 48 to the sound output of each loudspeaker while it controls Selector SE and the channel selection circuitry 31 and carries out sound output of each loudspeaker to sequence, and it controls the channel selection circuitry 31.

[0030] Next, actuation of the gestalt of the operation constituted in this way is explained with reference to the flow chart of drawing 3.

[0031] signal input terminal IN1 Or IN6 \*\*\*\* -- six regenerative signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are supplied, respectively. In addition, amplifier 32, loudspeaker 22a, or 22f may be connected how.

[0032] Now, a setup and connection decision of a loudspeaker shall be made. A microcomputer 37 is step S1 of drawing 3. It sets, the channel selection circuitry 31 is controlled, and the input terminal 1 of the crossover-less connection 31, i.e., a channel selection circuitry, thru/or 6 are connected to outgoing ends A and F, respectively. The outgoing ends A and F of the channel selection circuitry 31 shall be connected to loudspeaker 22a thru/or 22f through amplifier 32, respectively. In addition, if correspondence with each input edge of the channel selection circuitry 31 and each loudspeaker is clear, the connection condition of the channel selection circuitry 31 etc. is arbitrary, and good.

[0033] A microcomputer 37 controls Selector SE by this condition, and carries out sequential supply of the test signal from sound-source equipment 30 in it at each channel. Namely, step S2 Setting, a microcomputer 37 sets up the loop formation of T (in this case, T= 6) time, and changes n which shows selection of Selector SE from 1 to 6. Thereby, Selector SE is an outgoing end SE 1 first. It chooses, a test signal is given to the input edge 1 of the channel selecting arrangement 31, the outgoing ends [ SE / SE and / 3 ] 2 and -- are chosen one by one henceforth, and a test signal is given to the input terminals 2 and 3 of the channel selecting arrangement 31, and -- (step S3).

[0034] Selector SE is an outgoing end SE 1. In the condition of having chosen, a test signal is supplied to loudspeaker LF22a through the channel selection circuitry 31 and amplifier 32. In this way, sound is outputted from loudspeaker 22a (step S4). This sound is collected by three microphones 34 formed in remote control 33 thru/or 36 (step S5). In addition, although it is unknown, it is still good whether to carry out sound output of the test signal from which loudspeaker depending on the method of connection between amplifier 32 and each loudspeaker only by control of the selector SE of a microcomputer 37, and the channel selection circuitry 31.

[0035] A microphone 34 thru/or the output of 36 are step S6. Signal processing is set and carried out. That is, a microphone 34 thru/or the output of 36 are supplied to the electrical-potential-difference comparator circuit 47 through amplifier 41 thru/or 43 and a rectifier 44 thru/or 46. A voltage level is compared by the electrical-potential-difference comparator circuit 47, and a comparison result is supplied to the direction judging circuit 48. When a voltage level is very low, sound-collecting judges the direction judging circuit 48 to be the impossible thing, and it supplies a judgment result to a sending circuit 49. A sending circuit 49 transmits this judgment result to a microcomputer 37 with infrared radiation. In step S13, sound-collecting displays a microcomputer 37 on the display which does not illustrate the alarm display which shows that it was impossible.

[0036] When sound-collecting is not impossible, the electrical-potential-difference comparator circuit 47 is the following step S8. It sets and frequency characteristics are judged. When the bass region of the signal which carried out sound reception judges it as what is sufficiently big level as compared with a loud-sound region, the loudspeaker judges the electrical-potential-difference comparator circuit 47 to be what is loudspeaker SW22f only for bass. in this case -- since sound is outputted from loudspeaker 22a - - processing -- step S9 from -- it shifts to step S10 and a direction is judged by the direction judging circuit 48.

[0037] The direction judging circuit 48 judges the direction of a loudspeaker where sound is outputted based on the electrical-potential-difference comparison result, and determines the location of a loudspeaker in step S11. The judgment result of the direction judging circuit 48 is transmitted to a

microcomputer 37 through a sending circuit 49. That is, the loudspeakers which outputted sound are loudspeakers other than subwoofer SW22f, and a microcomputer 37 gets to know being arranged in the location of a predetermined distance on the left-hand side of [ front ] remote control 33.

[0038] At the following step S14, it judges whether T times of loop formations ended the microcomputer 37. In this case, since it is  $T = 1$ , a microcomputer 37 is step S2 about processing. It shifts and n is incremented. In this way, it is the outgoing end SE 2 of Selector SE next. It is chosen and a test signal is supplied to loudspeaker RF22b through the channel selection circuitry 31 and amplifier 32 (step S3).

[0039] Henceforth, step S4 Or processing of S11 is repeated. in addition -- the case where sound is outputted from loudspeaker SW22f -- the electrical-potential-difference comparator circuit 47 -- a high frequency component -- comparing -- what has the level of a low frequency component high enough -- judging -- step S9 from -- it is decided that the loudspeaker which is shifting and carrying out sound output of the processing to step S12 will be what is loudspeaker SW22f. This decision result is also transmitted to a microcomputer 37.

[0040] In this way, judgment results, such as a direction and a location, are inputted into a microcomputer 37 about all six loudspeaker 22a thru/or 22f. Next, a microcomputer 37 examines the judgment result about all loudspeakers. That is, a microcomputer 37 judges first whether processing is shifted to step S15 from step S14, and a loudspeaker exists in the same location. When it judges with that which recognizes loudspeaker existence in the location of \*\*\*\* identitas for the reasons of the arrangement condition of a loudspeaker, or a connection mistake, a microcomputer 37 makes the same location display the alarm display which shows that a loudspeaker exists on the display which is not illustrated. When that is not right, a microcomputer 37 judges whether the loudspeaker exists in the regular location in the following step S16.

[0041] When all the loudspeakers judge it as what is arranged in the location of normal, a microcomputer 37 ends processing, the channel selection circuitry 31 is controlled, and it is the signal input edge IN1. Or IN6 Connection between an input edge and an outgoing end is directed so that the loudspeaker to which the inputted signal corresponds may be supplied. Thereby, it is the signal input terminal IN1. Or IN6 Six inputted regenerative signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are supplied to loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f, respectively. Therefore, a user does not need to grasp whether which signal input terminal and loudspeaker should be connected.

[0042] When the loudspeaker which is not arranged in the location of normal exists, a microcomputer 37 shifts processing to step S18 from step S16, and the alarm display which shows that the loudspeaker is not arranged in the location of normal is displayed. Subsequently, in step S19, a microcomputer 37 controls the channel selection circuitry 31, and controls connection about the signal which should be supplied to the loudspeaker which is not arranged in the location of normal to make it output from the loudspeaker arranged near the location of normal.

[0043] Thus, while supplying a test signal to each loudspeaker one by one and making sound output independently from each loudspeaker in the gestalt of this operation By collecting the output sound of each loudspeaker with the microphone attached in remote control The class, the direction, and distance of the loudspeaker which outputted sound are judged from the level and the frequency component of the outputted sound, and while displaying the alarm display for directing arrangement of normal based on a judgment result, optimal connection is made automatically. Thereby, a user's connection and a setup are simplified remarkably.

[0044] Drawing 4 is the block diagram showing the gestalt of other operations of this invention. In drawing 4, the same sign is given to the same component as drawing 1, and explanation is omitted. The gestalt of this operation is the example which used the loudspeaker with a channel optional feature.

[0045] While the gestalt of this operation replaces with loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f, respectively and adopts loudspeaker LF51a, RF51b, CF51c, LS51d, RS51e, and SW51f as them, the channel selection circuitry 31 is deleted and it differs from the gestalt of operation of drawing 1 in that the same function was prepared in loudspeaker 51a thru/or 51f.



[0046] Signal input terminal IN1 Or IN6 The signal inputted is supplied to loudspeaker 51a thru/or 51f through amplifier 32 and a cable 52. moreover, outgoing end SE 1 of Selector SE Or SE6 from -- a test signal is also supplied to loudspeaker 51a thru/or 51f through amplifier 32 and a cable 52.

[0047] Drawing 5 is the block diagram showing loudspeaker 51a thru/or a 51f internal configuration. In addition, it is clear that loudspeaker 51a thru/or 51f are not [ the acoustic feature etc. ] the same. The cable 52 which connects amplifier 32 and each loudspeaker 51a thru/or 51f had multicore structure, and is equipped with n acoustic signal lines which transmit the signal inputted into n input edges ( drawing 4 n= 6) (it corresponds to n channels) of amplifier 32, respectively, and one selection-signal line which transmits a selection signal from a microcomputer 37.

[0048] n acoustic signal lines are connected to each loudspeaker 51a thru/or the 51f channel selection circuitry 55, and one selection-signal line is connected to DEFOMATTA 56. By one selection-signal line, the serial transmission of the selection signal from a microcomputer 37 is carried out. The selection signal has the header and specifies whether a selection signal is for which loudspeakers by the header.

[0049] DEFOMATTA 56 has an identifier (SP-n) for specifying each loudspeaker as a meaning. An identifier may be set up fixed at the factory-shipments time of a product, and even if a user is selectable in an identifier, it is good. DEFOMATTA 56 sets either a channel 1 (CH-1) thru/or n (CH-n) as the channel selection circuitry 55 based on the selection signal from a microcomputer 37. A setup of this channel is performed for every loudspeaker.

[0050] As for each loudspeaker 51a thru/or the 51f channel selection circuitry 55, a channel is set up independently by each DEFOMATTA 56. Each DEFOMATTA 56 supplies the acoustic signal corresponding to the set-up channel to the output section 57, and carries out sound output.

[0051] Next, actuation of the gestalt of the operation constituted in this way is explained with reference to the flow chart of drawing 6. In drawing 6, the same sign is given to the same procedure as drawing 3, and explanation is omitted.

[0052] signal input terminal IN1 Or IN6 \*\*\*\* -- six regenerative signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are supplied, respectively. Now, a setup and connection decision of a loudspeaker shall be made. In step S21 of drawing 6, a microcomputer 37 outputs a selection signal and sets all SP-1 thru/or SP-T (the example of drawing 4 T= 6) as CH-2. For example, loudspeaker 51a thru/or a 51f identifier shall be SP-1 thru/or SP-6, respectively. Each loudspeaker 51a thru/or 51f DEFOMATTA 56 set the channel which each channel selection circuitry 55 chooses as CH-2.

[0053] Next, a microcomputer 37 supplies a test signal to CH-1 in step S22. That is, a microcomputer 37 controls Selector SE and makes the test signal from sound-source equipment 30 supply to the input edge equivalent to CH-1 of amplifier 32. Since the signal line with which the channel selection circuitry 55 is equivalent to CH-2 to the test signal flowing on the acoustic signal line equivalent to CH-1 in a cable 52 is chosen, in this phase, sound is not outputted from all loudspeaker 51a thru/or 51f.

[0054] Next, step S2 It sets and the loop formation of T counts is set up. Subsequently, in step S23, a microcomputer 37 outputs a selection signal and sets CH-1 as SP-n. Supposing n is 1, CH-1 is made chosen as the loudspeaker of SP-1, i.e., loudspeaker LF51a. DEFOMATTA 56 of loudspeaker 51a makes the signal line which is equivalent to the channel selection circuitry 55 CH-1 based on a selection signal choose. Sound output of the test signal is supplied and carried out to the output section 57 through the signal line which the channel selection circuitry 55 of loudspeaker 51a chose.

[0055] Thereby, the sound based on a test signal is outputted only from loudspeaker LF51a (step S24). The following step S5 Or processing of S10, S12, and S13 is the same as that of the flow of drawing 3 of operation. At step S25, the loudspeaker location of loudspeaker 51a is judged and it memorizes as positional information of loudspeaker 51a specified by identifier SP-1. In addition, it is the same as that of the gestalt of operation of drawing 1 that the judgment of a loudspeaker location is performed by the direction judging circuit 48 in remote control 33, and positional information is memorized by the memory which a microcomputer 37 does not illustrate.

[0056] At the following step S26, CH-2 are set as loudspeaker 51a of identifier SP-1. Thereby, loudspeaker 51a as well as other loudspeakers is made silent. Henceforth, processing from step S23 to step S26 is repeated until n is set to 6. In this way, all loudspeaker 51a thru/or the 51f positional



information shown in a microcomputer 37 by identifier SP-1 thru/or SP-6 is memorized. In addition, about loudspeaker SW51f, it is judged that sound output only of the low frequency component is carried out by the electrical-potential-difference comparator circuit 47, and it is memorized as information that it is the subwoofer loudspeaker SW.

[0057] The procedure which examines the judgment result about the positional information over each loudspeaker is the same as that of the gestalt of operation of drawing 3. In addition, warning of whether a DEFOMATTA identifier is a meaning is also displayed in step S27.

[0058] A microcomputer 37 is based on the judgment result of positional information, and is the signal input edge IN1. Or IN6 A selection signal is outputted so that sound output may be carried out from the loudspeaker to which the inputted signal corresponds. Thereby, it is the signal input terminal IN1. Or IN6 Six inputted regenerative signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are supplied to loudspeaker LF51a, RF51b, CF51c, LS51d, RS51e, and SW51f, respectively. Therefore, a user does not need to grasp whether which signal input terminal and loudspeaker should be connected.

[0059] Moreover, since the same alarm display as the gestalt of operation of drawing 1 is displayed when each loudspeaker 51a thru/or the location of 51f have shifted from the location of normal, a user can arrange each loudspeaker in the location of normal easily by referring to this alarm display.

[0060] Thus, also in the gestalt of this operation, the same effectiveness as the gestalt of operation of drawing 1 can be acquired.

[0061] Drawing 7 is the block diagram showing the gestalt of other operations of this invention. In drawing 7, the same sign is given to the same component as drawing 1, and explanation is omitted. The gestalt of this operation is the example which was made to carry out a serial transmission also about the acoustic signal.

[0062] Replace the gestalt of this operation with loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f, respectively, and it adopts loudspeaker LF65a, RF65b, CF65c, LS65d, RS65e, and SW65f as them. The output of the channel selection circuitry 31 is given to a formatter 62, and the point transmitted with the cable 63 constituted with one signal line differs from the gestalt of operation of drawing 1.

[0063] The output of the channel selection circuitry 31 is supplied to a formatter 62. A formatter 62 adds the header which shows the loudspeaker corresponding to 1 to 1 to the outgoing ends A and F of the channel selection circuitry 31 as a header of these acoustic signals, and outputs it to a cable 63 while it carries out the serial transmission of the acoustic signal from each outgoing-ends A and F of the channel selection circuitry 31. That is, the loudspeaker which carries out sound output of the acoustic signal transmitted henceforth [ header ] is shown by the header. Thereby, even when using one transmission line, the independence of the signal of each channel can be secured. A formatter 62, each loudspeaker 65a, or 65f of cables 63 connect.

[0064] Drawing 8 is the block diagram showing loudspeaker 65a in drawing 7 thru/or a 65f internal configuration. In addition, it is clear that loudspeaker 65a thru/or 65f are not [ the acoustic feature etc. ] the same.

[0065] The signal transmitted by the cable 63 is supplied to each DEFOMATTA (each loudspeaker 65a thru/or 65f) 66. DEFOMATTA 66 is carrying out deformatting of the part for the header unit of the inputted signal, and judges whether the identifier of the loudspeaker of a gap is set up. Only when an identifier is in agreement, an acoustic signal is outputted to the D/A conversion circuit 67. The D/A conversion circuit 67 changes the inputted acoustic signal into an analog signal, and outputs it to amplifier 68. Amplifier 68 amplifies the inputted acoustic signal and outputs it to the output section 69. The output section 69 outputs the sound based on the inputted acoustic signal.

[0066] In addition, although explained as that whose acoustic signal transmitted is a digital signal, it is clear that you may be an analog signal.

[0067] Next, actuation of the gestalt of the operation constituted in this way is explained.

[0068] Control of the microcomputer 37 at the time of a setup and connection decision of a loudspeaker is the same as that of the gestalt of operation of drawing 1. A microcomputer 37 directs crossover-less connection to the channel selection circuitry 31, and switches the input edge of the channel selection

circuitry 31 which supplies a test signal by Selector SE. DEFOMATTA 62 adds the header which made the outgoing ends A and F of the channel selection circuitry 31 correspond to loudspeaker 65a thru/or 65f, respectively, and outputs a test signal to a cable 63.

[0069] For example, Selector SE is an outgoing end SE 1. A test signal is transmitted by the data stream as which the identifier which directs loudspeaker 65a by the header was specified when having chosen. This test signal is supplied to the D/A conversion circuit 67 through DEFOMATTA 66 of loudspeaker 65a, and sound output is carried out from the output section 69 through amplifier 68. Therefore, the sound based on a test signal is outputted by loudspeaker 65a in this case.

[0070] Henceforth, a microcomputer 37 carries out the outgoing end of Selector SE at a sequential change, and carries out sequential supply of the test signal at loudspeaker 65b thru/or 65f. This operation is the same as that of the gestalt of operation of drawing 1.

[0071] Thus, also in the gestalt of this operation, the same effectiveness as the gestalt of operation of drawing 1 can be acquired.

[0072] Drawing 9 is the block diagram showing the gestalt of other operations of this invention. In drawing 9, the same sign is given to the same component as drawing 1, and explanation is omitted. The gestalt of this operation is the example which omitted the microphone.

[0073] while the gestalt of this operation omits remote control 33 -- a selector 72, the microphone amplifier 73, the root mean square circuit 74, and delay -- a time check -- the point which added the circuit 75 differs from the gestalt of operation of drawing 1.

[0074] It is made to operate as a microphone loudspeakers other than the loudspeaker which carries out sound output of the test signal in the gestalt of this operation at the time of a setup and connection decision of a loudspeaker. A selector 72 is controlled by the microcomputer 37 (illustration abbreviation), is interlocked with the channel selection circuitry 31 and Selector SE, and operates. That is, at the time of a setup and connection decision of a loudspeaker, a selector 72 connects other loudspeakers and microphone amplifier 73 while connecting the loudspeaker and amplifier 32 which supply a test signal. A selector 72 supplies the output of amplifier 32 to each loudspeaker 22a thru/or 22f at the time of real use.

[0075] The microphone amplifier 73 amplifies loudspeaker 22a thru/or a 22f sound-collecting signal, and outputs it to the root mean square circuit 74. the test signal from sound-source equipment 30 is also supplied to the root mean square circuit 74 -- having -- \*\*\*\* -- the root mean square circuit 74 -- the root mean square of a test signal and the inputted sound-collecting signal -- asking -- a calculation result -- delay -- a time check -- it outputs to a circuit 75. delay -- a time check -- a circuit 75 is clocking the signal time of concentration to each loudspeaker which collected the sound based on the inputted root mean square result, and asks for loudspeaker 22a thru/or the location of 22f. delay -- a time check -- a circuit 75 outputs the information on the location of each loudspeaker for which it asked to a microcomputer 37.

[0076] Next, actuation of the gestalt of the operation constituted in this way is explained with reference to the flow chart of drawing 10. In drawing 10, the same sign is given to the same procedure as drawing 3, and explanation is omitted.

[0077] At the time of a setup and connection decision of a loudspeaker, loudspeakers other than one loudspeaker which outputs the sound based on a test signal are operated as a substitution microphone. That is, a microcomputer 37 sets up connection so that the sound-collecting signal from other loudspeakers may be supplied to the microphone amplifier 73, while it controls Selector SE, the channel selection circuitry 31, and a selector 72 in step S31 and supplies a test signal to the n-th channel.

[0078] Step S4 A sound is collected by other loudspeakers operating as a substitution microphone in step S32 by outputting sound from the loudspeaker to which it set and the test signal was supplied. The sound-collecting signal of these substitution microphones is supplied to the microphone amplifier 73 through a selector 72, and signal processing of step S33 is performed.

[0079] That is, the sound-collecting signal amplified with the microphone amplifier 73 is given to the root mean square circuit 74, and a root mean square is carried out with a test signal. delay -- a time check -- a circuit 75 finds the signal time of concentration to each loudspeaker based on a root mean

square result on the basis of a test signal. a microcomputer 37 -- all loudspeakers -- a test signal -- supplying -- delay -- a time check -- a circuit 75 asks for the location of each loudspeaker from the result of an operation of the signal time of concentration about all loudspeakers.

[0080] Other operations are the same as that of the gestalt of operation of drawing 1.

[0081] Thus, in the gestalt of this operation, the same effectiveness as the gestalt of operation of drawing 1 can be acquired. Furthermore, in the gestalt of this operation, a microphone can be omitted, the activity of arrangement of remote control etc. can be omitted, and a setup will become still easier.

[0082] Drawing 11 is the block diagram showing the gestalt of other operations of this invention. In drawing 11, the same sign is given to the same component as drawing 7, and explanation is omitted. Drawing 12 is the block diagram showing loudspeaker 81a in drawing 11 thru/or a 81f internal configuration.

[0083] It differs from the gestalt of operation of drawing 7 in that replaced the gestalt of this operation with the formatter 62, adopted the formatter 80, replaced with loudspeaker LF65a, RF65b, CF65c, LS65d, RS65e, and SW65f, adopted loudspeaker LF81a, RF81b, CF81c, LS81d, RS81e, and SW81f, respectively, and the channel selection circuitry 31 was omitted. The serial transmission of the acoustic signal is carried out also in the gestalt of this operation.

[0084] A selection signal is inputted into a formatter 80 from a microcomputer 37. A formatter 80 distinguishes and carries out the serial transmission of the acoustic signal and selection signal of each channel which are inputted into an input terminal 1 thru/or 6 by the header.

[0085] A selection signal is a signal for determining whether to choose the acoustic signal of which channel, and is added corresponding to each loudspeaker. A selection-signal identifier is added to a selection signal as a header. A selection-signal identifier sets up correspondence with each loudspeaker and a selection signal like a loudspeaker identifier, and it is decided by the selection-signal identifier whether each loudspeaker uses which selection signal beforehand.

[0086] Moreover, an acoustic signal identifier is added to each acoustic signal as a header. An acoustic signal identifier shows whether the playback output of the acoustic signal should be carried out from the loudspeaker of which location, and shows the channel of an acoustic signal. By specifying the channel shown by the acoustic signal identifier by the selection signal, each loudspeaker becomes possible [ choosing and outputting the acoustic signal with which it was specified of the acoustic signals by which the serial transmission is carried out ] from a formatter 80.

[0087] Loudspeaker 81a thru/or 81f are constituted by DEFOMATTA 84, the D/A conversion circuit 87, amplifier 88, and the output section 89. The selection-signal identifier is assigned for every loudspeaker, and DEFOMATTA 85 of a selection signal chooses the selection signal of each loudspeaker proper. A selection signal is supplied to DEFOMATTA 86 of the selected acoustic signal, and DEFOMATTA 86 chooses the acoustic signal of the channel specified by the selection signal, and outputs it to the D/A conversion circuit 87. The D/A conversion circuit 87 changes the inputted signal into a digital signal, gives it to amplifier 88, and amplifier 88 amplifies the inputted acoustic signal and it outputs it to the output section 89. The output section 89 outputs the sound based on the inputted acoustic signal.

[0088] Next, actuation of the gestalt of the operation constituted in this way is explained.

[0089] A microcomputer 37 outputs the selection signal for specifying the channel which should be chosen for every loudspeaker to a formatter 80. A formatter 80 adds the selection-signal identifier corresponding to each loudspeaker to the selection signal for every loudspeaker as a header. Moreover, a formatter 80 adds as a header the acoustic signal identifier which shows the channel about the acoustic signal inputted into an input terminal 1 thru/or 6. The serial transmission of these selection signals, a selection-signal identifier, an acoustic signal, and the acoustic signal identifier is carried out, and they are supplied to each loudspeaker 81a thru/or 81f.

[0090] Each loudspeaker 81a thru/or 81f DEFOMATTA 85 take out the selection signal corresponding to the selection-signal identifier assigned to each loudspeaker, and outputs it to DEFOMATTA 86. DEFOMATTA 86 chooses the acoustic signal of the specified channel with a selection signal. Thereby, each loudspeaker can incorporate alternatively the acoustic signal inputted into the input terminal 1 of a

formatter 80 thru/or 6.

[0091] After the acoustic signal chosen by DEFOMATTA 84 is returned to an analog signal by the D/A conversion circuit 87 and is amplified with amplifier 88, sound output of it is carried out from the output section 89.

[0092] A microcomputer 37 makes the sound based on [ in it / based on sequence in the time of a setup and connection decision of a loudspeaker ] a test signal in a case output from each loudspeaker with control and the selection signal of Selector SE. Other operations are the same as that of the gestalt of operation of drawing 7.

[0093] Thus, also in the gestalt of this operation, the same effectiveness as the gestalt of operation of drawing 7 can be acquired.

[0094] Furthermore, to this invention, various combination is possible. For example, drawing 13 shows the example which built the selector in the loudspeaker using the substitution microphone. In drawing 13, the same sign is given to the same component as drawing 4 and drawing 9, and explanation is omitted.

[0095] In the example of drawing 13, the acoustic signal from a selector 72 and the selection signal from a microcomputer 37 are supplied to loudspeaker 51a thru/or 51f through a cable 52. With a selection signal, the acoustic signal of six channels can be alternatively supplied to each loudspeaker 51a thru/or 51f.

[0096] Other configurations and operations are the same as that of the gestalt of operation of drawing 4 and drawing 9.

[0097] Moreover, drawing 14 and drawing 15 are based on the combination of the gestalt of each above-mentioned implementation, and combine a location, a serial transmission, etc. of a channel selection circuit to the gestalt of operation of drawing 9. In drawing 15 and drawing 16, the same sign is given to the same component as each drawing of the gestalt of the above-mentioned implementation.

DEFOMATTA 100 is for carrying out deformatting of the format used on the occasion of transmission of the sound-collecting signal from loudspeaker 90a thru/or 90f. By one cable, the serial transmission of a formatter 62 or the output of 80 is carried out, and it is supplied to loudspeaker 90a thru/or 90f.

[0098] As shown in drawing 16, it judges [ loudspeaker 90a thru/or 90f ] whether self-addressed data were transmitted by DEFOMATTA 91. DEFOMATTA 91 gives a self-addressed acoustic signal to the D/A conversion circuit 92, and changes it into an analog signal. After amplifying the output of the D/A conversion circuit 92 with amplifier 93, sound output is carried out from the output section 95 through a switch 94.

[0099] Moreover, when the sound which other loudspeakers outputted is collected by the output section 95, a sound-collecting signal is supplied to amplifier 96 from a switch 94. Amplifier 96 amplifies a sound-collecting signal, gives it to the A/D-conversion circuit 97, and the A/D-conversion circuit 97 is changed into a digital signal, and it outputs it to a formatter 98. A formatter 98 adds a self identifier to a digital sound-collecting signal, and transmits it to a cable.

[0100] In addition, deformation various by within the limits which does not deviate from the main point of a proposal besides the gestalt of each above-mentioned implementation is possible for this invention. For example, although the example of six DORUBI digital loudspeakers was explained, it can apply also to the other method and the number's of channels not being limited etc. is clear.

[0101]

[Effect of the Invention] As explained above, according to this invention, it has the effectiveness that connection and a setup can be simplified.

---

[Translation done.]

## \* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

MEANS

---

[Means for Solving the Problem] Two or more loudspeakers to which the channel arrangement equipment concerning this invention corresponded to the input signal of two or more channels, respectively, A channel selection means to make said two or more input terminals into which two or more input signals of a channel are inputted, respectively and said two or more loudspeakers correspond to 1 to 1, A sound-collecting means to collect the sound which said two or more loudspeakers outputted, and to output a sound-collecting signal, Give said test signal to said two or more loudspeakers one by one, and arrangement of two or more of said loudspeakers is judged with said sound-collecting signal from each loudspeaker to be a sound-source means to generate a test signal. While notifying whether said two or more loudspeakers are arranged in the location of normal based on a judgment result, said channel selection means is controlled and said control means which makes two or more input signals of a channel supply to said two or more loudspeakers is provided.

[0016] A control means gives the test signal by the sound-source means to each loudspeaker one by one, and makes sound output in this invention. Furthermore, a control means judges arrangement of two or more loudspeakers, and it controls a channel selection means by the sound-collecting signal based on the test signal by the sound-collecting means while it notifies whether two or more loudspeakers are arranged in the location of normal based on the judgment result. Thereby, the input signal of two or more channels is automatically supplied to each corresponding loudspeaker.

[0017]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to a drawing. Drawing 1 is the block diagram showing the gestalt of 1 operation of the channel arrangement equipment concerning this invention.

[0018] The gestalt of this operation supplies a test signal to each of two or more loudspeakers one by one, and it carries out sound reception with a microphone (henceforth a microphone), and while optimizing connection of a signal input and a loudspeaker automatically by the sound reception result, it makes it possible to notify an effective setup of a loudspeaker, and makes it possible to build the optimal playback environment by easy actuation.

[0019] signal input terminal IN1 Or IN6 \*\*\*\* -- each signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are inputted, respectively. For example, these signals are the same as that of what was outputted from the DVD player 1 of drawing 17. Signal input terminal IN1 Or IN6 It connects with each input edge 1 of the channel selection circuitry 31 thru/or 6, respectively.

[0020] Each input edge 1 of the channel selection circuitry 31 thru/or 6 are connected also to sound-source equipment 30 through Selector SE. Sound-source equipment 30 outputs a predetermined test signal to the common edge C of Selector SE. Selector SE is an outgoing end SE 1. Or SE6 It is an outgoing end SE 1 about the test signal which has, was controlled by the microcomputer (henceforth a microcomputer) 37 and was inputted into the common edge C. Or SE6 It outputs alternatively from one.

[0021] Outgoing end SE 1 of Selector SE Or SE6 It connects with the input edge 1 of the channel selection circuitry 31 thru/or 6, respectively. The channel selection circuitry 31 has six outgoing ends A and E, can be controlled by the microcomputer 37, and can connect now the input edge 1 thru/or 6 and

outgoing ends A and E to arbitration by 1 to 1.

[0022] The signal outputted from the outgoing ends A and E of the channel selection circuitry 31 is connected to six input edges of amplifier 32. Amplifier 32 amplifies the inputted signal and outputs it from six outgoing ends. Six outgoing ends of amplifier 32 are connected to loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f, respectively.

[0023] Loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f are the right-and-left front loudspeakers, the central front loudspeakers, right-and-left back loudspeakers, and subwoofer loudspeakers of DORUBI digital 5.1ch. Loudspeaker LF22a, RF22b, and CF22c are arranged among these loudspeakers in the front left, the indoor front right, and the indoor center of the front which are not illustrated, respectively, loudspeaker LS22d and RS22e are arranged on the indoor back left and the indoor back right, and loudspeaker SW22f is arranged in an indoor proper location.

[0024] In the gestalt of this operation, sound reception of loudspeaker 22a thru/or the 22f sound output is carried out with a microphone, a sound reception result is transmitted to a microcomputer 37, and Selector SE and the channel selection circuitry 31 are controlled. That is, a microcomputer 37 judges the right connection between a signal input and a loudspeaker in the proper location and class list of a loudspeaker by supplying the test signal from sound-source equipment 30 to loudspeaker 22a thru/or 22f with a sequential change at the time of a setup and connection decision of a loudspeaker, and carrying out sound output to all loudspeaker 22a thru/or 22f independently, respectively. And in order to mitigate complicatedness, such as wiring, on the occasion of transmission of the sound reception result of a microphone, in the gestalt of this operation, a microphone is added to remote control equipments (henceforth remote control), such as sound-source equipment 30 or a DVD player which is not illustrated, and it uses for them.

[0025] At the time of a setup and connection decision of a loudspeaker, remote control 33 is arranged in loudspeaker 22a thru/or the 22f center of \*\*\*\*. The sound reception section which microphones 34 and 35 do not illustrate, respectively is turned ahead, and it is attached in front end right and left of remote control 33, and the sound reception section which a microphone 36 does not illustrate is back turned in the center of the back end, and it is attached in it.

[0026] Drawing 2 is the block diagram showing the configuration of a processing block of such remote control 33.

[0027] In drawing 2, the microphones 34 and 35 of front end right and left and the microphone 36 of the center of the back end carry out sound reception of the output sound from each loudspeaker, change it into an electrical signal, and are supplied to amplifier 41 thru/or 43, respectively. Amplifier 41 thru/or 43 amplify the inputted signal, and outputs it to a rectifier 44 thru/or 46, respectively. A rectifier 44 thru/or 46 rectify the inputted signal, and outputs it to the electrical-potential-difference comparator circuit 47.

[0028] The electrical-potential-difference comparator circuit 47 compares a microphone 34 the rectifier 44 corresponding to the output of 36 thru/or the output voltage level of 46, and outputs a comparison result to the direction judging circuit 48. As mentioned above, at the time of a setup and connection decision of a loudspeaker, sound output of each loudspeaker is carried out independently. The direction judging circuit 48 judges the direction and distance over remote control 33 of the loudspeaker which is carrying out sound output while judging whether sound is outputted from which loudspeaker based on the comparison result of a voltage level. In addition, the electrical-potential-difference comparator circuit 47 can also detect now the frequency characteristics of a microphone 34 thru/or the sound reception signal of 36. Thereby, subwoofer (SW) and the other loudspeaker are discriminable.

[0029] The direction judging circuit 48 outputs a judgment result to a sending circuit 49. A sending circuit 49 transmits the inputted judgment result with infrared radiation. A microcomputer 37 has an infrared light sensing portion, and incorporates the judgment result of the direction judging circuit 48 outputted from the sending circuit 49. At the time of a setup and the connection decision of a loudspeaker, the display which does not illustrate the notice about proper arrangement of a loudspeaker performs it while a microcomputer 37 judges the right connection between a signal input edge and each loudspeaker based on the judgment result of the direction judging circuit 48 to the sound output of each



loudspeaker while it controls Selector SE and the channel selection circuitry 31 and carries out sound output of each loudspeaker to sequence, and it controls the channel selection circuitry 31.

[0030] Next, actuation of the gestalt of the operation constituted in this way is explained with reference to the flow chart of drawing 3.

[0031] signal input terminal IN1 Or IN6 \*\*\*\* -- six regenerative signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are supplied, respectively. In addition, amplifier 32, loudspeaker 22a, or 22f may be connected how.

[0032] Now, a setup and connection decision of a loudspeaker shall be made. A microcomputer 37 is step S1 of drawing 3. It sets, the channel selection circuitry 31 is controlled, and the input terminal 1 of the crossover-less connection 31, i.e., a channel selection circuitry, thru/or 6 are connected to outgoing ends A and F, respectively. The outgoing ends A and F of the channel selection circuitry 31 shall be connected to loudspeaker 22a thru/or 22f through amplifier 32, respectively. In addition, if correspondence with each input edge of the channel selection circuitry 31 and each loudspeaker is clear, the connection condition of the channel selection circuitry 31 etc. is arbitrary, and good.

[0033] A microcomputer 37 controls Selector SE by this condition, and carries out sequential supply of the test signal from sound-source equipment 30 in it at each channel. Namely, step S2 Setting, a microcomputer 37 sets up the loop formation of T (in this case, T= 6) time, and changes n which shows selection of Selector SE from 1 to 6. Thereby, Selector SE is an outgoing end SE 1 first. It chooses, a test signal is given to the input edge 1 of the channel selecting arrangement 31, the outgoing ends [ SE / SE and / 3 ] 2 and -- are chosen one by one henceforth, and a test signal is given to the input terminals 2 and 3 of the channel selecting arrangement 31, and -- (step S3).

[0034] Selector SE is an outgoing end SE 1. In the condition of having chosen, a test signal is supplied to loudspeaker LF22a through the channel selection circuitry 31 and amplifier 32. In this way, sound is outputted from loudspeaker 22a (step S4). This sound is collected by three microphones 34 formed in remote control 33 thru/or 36 (step S5). In addition, although it is unknown, it is still good whether to carry out sound output of the test signal from which loudspeaker depending on the method of connection between amplifier 32 and each loudspeaker only by control of the selector SE of a microcomputer 37, and the channel selection circuitry 31.

[0035] A microphone 34 thru/or the output of 36 are step S6. Signal processing is set and carried out. That is, a microphone 34 thru/or the output of 36 are supplied to the electrical-potential-difference comparator circuit 47 through amplifier 41 thru/or 43 and a rectifier 44 thru/or 46. A voltage level is compared by the electrical-potential-difference comparator circuit 47, and a comparison result is supplied to the direction judging circuit 48. When a voltage level is very low, sound-collecting judges the direction judging circuit 48 to be the impossible thing, and it supplies a judgment result to a sending circuit 49. A sending circuit 49 transmits this judgment result to a microcomputer 37 with infrared radiation. In step S13, sound-collecting displays a microcomputer 37 on the display which does not illustrate the alarm display which shows that it was impossible.

[0036] When sound-collecting is not impossible, the electrical-potential-difference comparator circuit 47 is the following step S8. It sets and frequency characteristics are judged. When the bass region of the signal which carried out sound reception judges it as what is sufficiently big level as compared with a loud-sound region, the loudspeaker judges the electrical-potential-difference comparator circuit 47 to be what is loudspeaker SW22f only for bass. in this case -- since sound is outputted from loudspeaker 22a - - processing -- step S9 from -- it shifts to step S10 and a direction is judged by the direction judging circuit 48.

[0037] The direction judging circuit 48 judges the direction of a loudspeaker where sound is outputted based on the electrical-potential-difference comparison result, and determines the location of a loudspeaker in step S11. The judgment result of the direction judging circuit 48 is transmitted to a microcomputer 37 through a sending circuit 49. That is, the loudspeakers which outputted sound are loudspeakers other than subwoofer SW22f, and a microcomputer 37 gets to know being arranged in the location of a predetermined distance on the left-hand side of [ front ] remote control 33.

[0038] At the following step S14, it judges whether T times of loop formations ended the



microcomputer 37. In this case, since it is  $T=1$ , a microcomputer 37 is step S2 about processing. It shifts and  $n$  is incremented. In this way, it is the outgoing end SE 2 of Selector SE next. It is chosen and a test signal is supplied to loudspeaker RF22b through the channel selection circuitry 31 and amplifier 32 (step S3).

[0039] Henceforth, step S4 Or processing of S11 is repeated. in addition -- the case where sound is outputted from loudspeaker SW22f -- the electrical-potential-difference comparator circuit 47 -- a high frequency component -- comparing -- what has the level of a low frequency component high enough -- judging -- step S9 from -- it is decided that the loudspeaker which is shifting and carrying out sound output of the processing to step S12 will be what is loudspeaker SW22f. This decision result is also transmitted to a microcomputer 37.

[0040] In this way, judgment results, such as a direction and a location, are inputted into a microcomputer 37 about all six loudspeaker 22a thru/or 22f. Next, a microcomputer 37 examines the judgment result about all loudspeakers. That is, a microcomputer 37 judges first whether processing is shifted to step S15 from step S14, and a loudspeaker exists in the same location. When it judges with that which recognizes loudspeaker existence in the location of \*\*\*\* identitas for the reasons of the arrangement condition of a loudspeaker, or a connection mistake, a microcomputer 37 makes the same location display the alarm display which shows that a loudspeaker exists on the display which is not illustrated. When that is not right, a microcomputer 37 judges whether the loudspeaker exists in the regular location in the following step S16.

[0041] When all the loudspeakers judge it as what is arranged in the location of normal, a microcomputer 37 ends processing, the channel selection circuitry 31 is controlled, and it is the signal input edge IN1. Or IN6 Connection between an input edge and an outgoing end is directed so that the loudspeaker to which the inputted signal corresponds may be supplied. Thereby, it is the signal input terminal IN1. Or IN6 Six inputted regenerative signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are supplied to loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f, respectively. Therefore, a user does not need to grasp whether which signal input terminal and loudspeaker should be connected.

[0042] When the loudspeaker which is not arranged in the location of normal exists, a microcomputer 37 shifts processing to step S18 from step S16, and the alarm display which shows that the loudspeaker is not arranged in the location of normal is displayed. Subsequently, in step S19, a microcomputer 37 controls the channel selection circuitry 31, and controls connection about the signal which should be supplied to the loudspeaker which is not arranged in the location of normal to make it output from the loudspeaker arranged near the location of normal.

[0043] Thus, while supplying a test signal to each loudspeaker one by one and making sound output independently from each loudspeaker in the gestalt of this operation By collecting the output sound of each loudspeaker with the microphone attached in remote control The class, the direction, and distance of the loudspeaker which outputted sound are judged from the level and the frequency component of the outputted sound, and while displaying the alarm display for directing arrangement of normal based on a judgment result, optimal connection is made automatically. Thereby, a user's connection and a setup are simplified remarkably.

[0044] Drawing 4 is the block diagram showing the gestalt of other operations of this invention. In drawing 4, the same sign is given to the same component as drawing 1, and explanation is omitted. The gestalt of this operation is the example which used the loudspeaker with a channel optional feature.

[0045] While the gestalt of this operation replaces with loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f, respectively and adopts loudspeaker LF51a, RF51b, CF51c, LS51d, RS51e, and SW51f as them, the channel selection circuitry 31 is deleted and it differs from the gestalt of operation of drawing 1 in that the same function was prepared in loudspeaker 51a thru/or 51f.

[0046] Signal input terminal IN1 Or IN6 The signal inputted is supplied to loudspeaker 51a thru/or 51f through amplifier 32 and a cable 52. moreover, outgoing end SE 1 of Selector SE Or SE6 from -- a test signal is also supplied to loudspeaker 51a thru/or 51f through amplifier 32 and a cable 52.

[0047] Drawing 5 is the block diagram showing loudspeaker 51a thru/or a 51f internal configuration. In

addition, it is clear that loudspeaker 51a thru/or 51f are not [ the acoustic feature etc. ] the same. The cable 52 which connects amplifier 32 and each loudspeaker 51a thru/or 51f had multicore structure, and is equipped with n acoustic signal lines which transmit the signal inputted into n input edges ( drawing 4 n= 6) (it corresponds to n channels) of amplifier 32, respectively, and one selection-signal line which transmits a selection signal from a microcomputer 37.

[0048] n acoustic signal lines are connected to each loudspeaker 51a thru/or the 51f channel selection circuitry 55, and one selection-signal line is connected to DEFOMATTA 56. By one selection-signal line, the serial transmission of the selection signal from a microcomputer 37 is carried out. The selection signal has the header and specifies whether a selection signal is for which loudspeakers by the header.

[0049] DEFOMATTA 56 has an identifier (SP-n) for specifying each loudspeaker as a meaning. An identifier may be set up fixed at the factory-shipments time of a product, and even if a user is selectable in an identifier, it is good. DEFOMATTA 56 sets either a channel 1 (CH-1) thru/or n (CH-n) as the channel selection circuitry 55 based on the selection signal from a microcomputer 37. A setup of this channel is performed for every loudspeaker.

[0050] As for each loudspeaker 51a thru/or the 51f channel selection circuitry 55, a channel is set up independently by each DEFOMATTA 56. Each DEFOMATTA 56 supplies the acoustic signal corresponding to the set-up channel to the output section 57, and carries out sound output.

[0051] Next, actuation of the gestalt of the operation constituted in this way is explained with reference to the flow chart of drawing 6. In drawing 6, the same sign is given to the same procedure as drawing 3, and explanation is omitted.

[0052] signal input terminal IN1 Or IN6 \*\*\*\* -- six regenerative signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are supplied, respectively. Now, a setup and connection decision of a loudspeaker shall be made. In step S21 of drawing 6, a microcomputer 37 outputs a selection signal and sets all SP-1 thru/or SP-T (the example of drawing 4 T= 6) as CH-2. For example, loudspeaker 51a thru/or a 51f identifier shall be SP-1 thru/or SP-6, respectively. Each loudspeaker 51a thru/or 51f DEFOMATTA 56 set the channel which each channel selection circuitry 55 chooses as CH-2.

[0053] Next, a microcomputer 37 supplies a test signal to CH-1 in step S22. That is, a microcomputer 37 controls Selector SE and makes the test signal from sound-source equipment 30 supply to the input edge equivalent to CH-1 of amplifier 32. Since the signal line with which the channel selection circuitry 55 is equivalent to CH-2 to the test signal flowing on the acoustic signal line equivalent to CH-1 in a cable 52 is chosen, in this phase, sound is not outputted from all loudspeaker 51a thru/or 51f.

[0054] Next, step S2 It sets and the loop formation of T counts is set up. Subsequently, in step S23, a microcomputer 37 outputs a selection signal and sets CH-1 as SP-n. Supposing n is 1, CH-1 is made chosen as the loudspeaker of SP-1, i.e., loudspeaker LF51a. DEFOMATTA 56 of loudspeaker 51a makes the signal line which is equivalent to the channel selection circuitry 55 CH-1 based on a selection signal choose. Sound output of the test signal is supplied and carried out to the output section 57 through the signal line which the channel selection circuitry 55 of loudspeaker 51a chose.

[0055] Thereby, the sound based on a test signal is outputted only from loudspeaker LF51a (step S24). The following step S5 Or processing of S10, S12, and S13 is the same as that of the flow of drawing 3 of operation. At step S25, the loudspeaker location of loudspeaker 51a is judged and it memorizes as positional information of loudspeaker 51a specified by identifier SP-1. In addition, it is the same as that of the gestalt of operation of drawing 1 that the judgment of a loudspeaker location is performed by the direction judging circuit 48 in remote control 33, and positional information is memorized by the memory which a microcomputer 37 does not illustrate.

[0056] At the following step S26, CH-2 are set as loudspeaker 51a of identifier SP-1. Thereby, loudspeaker 51a as well as other loudspeakers is made silent. Henceforth, processing from step S23 to step S26 is repeated until n is set to 6. In this way, all loudspeaker 51a thru/or the 51f positional information shown in a microcomputer 37 by identifier SP-1 thru/or SP-6 is memorized. In addition, about loudspeaker SW51f, it is judged that sound output only of the low frequency component is carried out by the electrical-potential-difference comparator circuit 47, and it is memorized as information that it is the subwoofer loudspeaker SW.

[0057] The procedure which examines the judgment result about the positional information over each loudspeaker is the same as that of the gestalt of operation of drawing 3. In addition, warning of whether a DEFOMATTA identifier is a meaning is also displayed in step S27.

[0058] A microcomputer 37 is based on the judgment result of positional information, and is the signal input edge IN1. Or IN6 A selection signal is outputted so that sound output may be carried out from the loudspeaker to which the inputted signal corresponds. Thereby, it is the signal input terminal IN1. Or IN6 Six inputted regenerative signals LF, RF, CF, LS, RS, and SW of DORUBI digital 5.1ch are supplied to loudspeaker LF51a, RF51b, CF51c, LS51d, RS51e, and SW51f, respectively. Therefore, a user does not need to grasp whether which signal input terminal and loudspeaker should be connected.

[0059] Moreover, since the same alarm display as the gestalt of operation of drawing 1 is displayed when each loudspeaker 51a thru/or the location of 51f have shifted from the location of normal, a user can arrange each loudspeaker in the location of normal easily by referring to this alarm display.

[0060] Thus, also in the gestalt of this operation, the same effectiveness as the gestalt of operation of drawing 1 can be acquired.

[0061] Drawing 7 is the block diagram showing the gestalt of other operations of this invention. In drawing 7, the same sign is given to the same component as drawing 1, and explanation is omitted. The gestalt of this operation is the example which was made to carry out a serial transmission also about the acoustic signal.

[0062] Replace the gestalt of this operation with loudspeaker LF22a, RF22b, CF22c, LS22d, RS22e, and SW22f, respectively, and it adopts loudspeaker LF65a, RF65b, CF65c, LS65d, RS65e, and SW65f as them. The output of the channel selection circuitry 31 is given to a formatter 62, and the point transmitted with the cable 63 constituted with one signal line differs from the gestalt of operation of drawing 1.

[0063] The output of the channel selection circuitry 31 is supplied to a formatter 62. A formatter 62 adds the header which shows the loudspeaker corresponding to 1 to 1 to the outgoing ends A and F of the channel selection circuitry 31 as a header of these acoustic signals, and outputs it to a cable 63 while it carries out the serial transmission of the acoustic signal from each outgoing ends A and F of the channel selection circuitry 31. That is, the loudspeaker which carries out sound output of the acoustic signal transmitted henceforth [ header ] is shown by the header. Thereby, even when using one transmission line, the independence of the signal of each channel can be secured. A formatter 62, each loudspeaker 65a, or 65f of cables 63 connect.

[0064] Drawing 8 is the block diagram showing loudspeaker 65a in drawing 7 thru/or a 65f internal configuration. In addition, it is clear that loudspeaker 65a thru/or 65f are not [ the acoustic feature etc. ] the same.

[0065] The signal transmitted by the cable 63 is supplied to each DEFOMATTA (each loudspeaker 65a thru/or 65f) 66. DEFOMATTA 66 is carrying out deformatting of the part for the header unit of the inputted signal, and judges whether the identifier of the loudspeaker of a gap is set up. Only when an identifier is in agreement, an acoustic signal is outputted to the D/A conversion circuit 67. The D/A conversion circuit 67 changes the inputted acoustic signal into an analog signal, and outputs it to amplifier 68. Amplifier 68 amplifies the inputted acoustic signal and outputs it to the output section 69. The output section 69 outputs the sound based on the inputted acoustic signal.

[0066] In addition, although explained as that whose acoustic signal transmitted is a digital signal, it is clear that you may be an analog signal.

[0067] Next, actuation of the gestalt of the operation constituted in this way is explained.

[0068] Control of the microcomputer 37 at the time of a setup and connection decision of a loudspeaker is the same as that of the gestalt of operation of drawing 1. A microcomputer 37 directs crossover-less connection to the channel selection circuitry 31, and switches the input edge of the channel selection circuitry 31 which supplies a test signal by Selector SE. DEFOMATTA 62 adds the header which made the outgoing ends A and F of the channel selection circuitry 31 correspond to loudspeaker 65a thru/or 65f, respectively, and outputs a test signal to a cable 63.

[0069] For example, Selector SE is an outgoing end SE 1. A test signal is transmitted by the data stream

as which the identifier which directs loudspeaker 65a by the header was specified when having chosen. This test signal is supplied to the D/A conversion circuit 67 through DEFOMATTA 66 of loudspeaker 65a, and sound output is carried out from the output section 69 through amplifier 68. Therefore, the sound based on a test signal is outputted by loudspeaker 65a in this case.

[0070] Henceforth, a microcomputer 37 carries out the outgoing end of Selector SE at a sequential change, and carries out sequential supply of the test signal at loudspeaker 65b thru/or 65f. This operation is the same as that of the gestalt of operation of drawing 1.

[0071] Thus, also in the gestalt of this operation, the same effectiveness as the gestalt of operation of drawing 1 can be acquired.

[0072] Drawing 9 is the block diagram showing the gestalt of other operations of this invention. In drawing 9, the same sign is given to the same component as drawing 1, and explanation is omitted. The gestalt of this operation is the example which omitted the microphone.

[0073] while the gestalt of this operation omits remote control 33 -- a selector 72, the microphone amplifier 73, the root mean square circuit 74, and delay -- a time check -- the point which added the circuit 75 differs from the gestalt of operation of drawing 1.

[0074] It is made to operate as a microphone loudspeakers other than the loudspeaker which carries out sound output of the test signal in the gestalt of this operation at the time of a setup and connection decision of a loudspeaker. A selector 72 is controlled by the microcomputer 37 (illustration abbreviation), is interlocked with the channel selection circuitry 31 and Selector SE, and operates. That is, at the time of a setup and connection decision of a loudspeaker, a selector 72 connects other loudspeakers and microphone amplifier 73 while connecting the loudspeaker and amplifier 32 which supply a test signal. A selector 72 supplies the output of amplifier 32 to each loudspeaker 22a thru/or 22f at the time of real use.

[0075] The microphone amplifier 73 amplifies loudspeaker 22a thru/or a 22f sound-collecting signal, and outputs it to the root mean square circuit 74. the test signal from sound-source equipment 30 is also supplied to the root mean square circuit 74 -- having -- \*\*\*\* -- the root mean square circuit 74 -- the root mean square of a test signal and the inputted sound-collecting signal -- asking -- a calculation result -- delay -- a time check -- it outputs to a circuit 75. delay -- a time check -- a circuit 75 is clocking the signal time of concentration to each loudspeaker which collected the sound based on the inputted root mean square result, and asks for loudspeaker 22a thru/or the location of 22f. delay -- a time check -- a circuit 75 outputs the information on the location of each loudspeaker for which it asked to a microcomputer 37.

[0076] Next, actuation of the gestalt of the operation constituted in this way is explained with reference to the flow chart of drawing 10. In drawing 10, the same sign is given to the same procedure as drawing 3, and explanation is omitted.

[0077] At the time of a setup and connection decision of a loudspeaker, loudspeakers other than one loudspeaker which outputs the sound based on a test signal are operated as a substitution microphone. That is, a microcomputer 37 sets up connection so that the sound-collecting signal from other loudspeakers may be supplied to the microphone amplifier 73, while it controls Selector SE, the channel selection circuitry 31, and a selector 72 in step S31 and supplies a test signal to the n-th channel.

[0078] Step S4 A sound is collected by other loudspeakers operating as a substitution microphone in step S32 by outputting sound from the loudspeaker to which it set and the test signal was supplied. The sound-collecting signal of these substitution microphones is supplied to the microphone amplifier 73 through a selector 72, and signal processing of step S33 is performed.

[0079] That is, the sound-collecting signal amplified with the microphone amplifier 73 is given to the root mean square circuit 74, and a root mean square is carried out with a test signal. delay -- a time check -- a circuit 75 finds the signal time of concentration to each loudspeaker based on a root mean square result on the basis of a test signal. a microcomputer 37 -- all loudspeakers -- a test signal -- supplying -- delay -- a time check -- a circuit 75 asks for the location of each loudspeaker from the result of an operation of the signal time of concentration about all loudspeakers.

[0080] Other operations are the same as that of the gestalt of operation of drawing 1.

[0081] Thus, in the gestalt of this operation, the same effectiveness as the gestalt of operation of drawing 1 can be acquired. Furthermore, in the gestalt of this operation, a microphone can be omitted, the activity of arrangement of remote control etc. can be omitted, and a setup will become still easier.

[0082] Drawing 11 is the block diagram showing the gestalt of other operations of this invention. In drawing 11, the same sign is given to the same component as drawing 7, and explanation is omitted. Drawing 12 is the block diagram showing loudspeaker 81a in drawing 11 thru/or a 81f internal configuration.

[0083] It differs from the gestalt of operation of drawing 7 in that replaced the gestalt of this operation with the formatter 62, adopted the formatter 80, replaced with loudspeaker LF65a, RF65b, CF65c, LS65d, RS65e, and SW65f, adopted loudspeaker LF81a, RF81b, CF81c, LS81d, RS81e, and SW81f, respectively, and the channel selection circuitry 31 was omitted. The serial transmission of the acoustic signal is carried out also in the gestalt of this operation.

[0084] A selection signal is inputted into a formatter 80 from a microcomputer 37. A formatter 80 distinguishes and carries out the serial transmission of the acoustic signal and selection signal of each channel which are inputted into an input terminal 1 thru/or 6 by the header.

[0085] A selection signal is a signal for determining whether to choose the acoustic signal of which channel, and is added corresponding to each loudspeaker. A selection-signal identifier is added to a selection signal as a header. A selection-signal identifier sets up correspondence with each loudspeaker and a selection signal like a loudspeaker identifier, and it is decided by the selection-signal identifier whether each loudspeaker uses which selection signal beforehand.

[0086] Moreover, an acoustic signal identifier is added to each acoustic signal as a header. An acoustic signal identifier shows whether the playback output of the acoustic signal should be carried out from the loudspeaker of which location, and shows the channel of an acoustic signal. By specifying the channel shown by the acoustic signal identifier by the selection signal, each loudspeaker becomes possible [ choosing and outputting the acoustic signal with which it was specified of the acoustic signals by which the serial transmission is carried out ] from a formatter 80.

[0087] Loudspeaker 81a thru/or 81f are constituted by DEFOMATTA 84, the D/A conversion circuit 87, amplifier 88, and the output section 89. The selection-signal identifier is assigned for every loudspeaker, and DEFOMATTA 85 of a selection signal chooses the selection signal of each loudspeaker proper. A selection signal is supplied to DEFOMATTA 86 of the selected acoustic signal, and DEFOMATTA 86 chooses the acoustic signal of the channel specified by the selection signal, and outputs it to the D/A conversion circuit 87. The D/A conversion circuit 87 changes the inputted signal into a digital signal, gives it to amplifier 88, and amplifier 88 amplifies the inputted acoustic signal and it outputs it to the output section 89. The output section 89 outputs the sound based on the inputted acoustic signal.

[0088] Next, actuation of the gestalt of the operation constituted in this way is explained.

[0089] A microcomputer 37 outputs the selection signal for specifying the channel which should be chosen for every loudspeaker to a formatter 80. A formatter 80 adds the selection-signal identifier corresponding to each loudspeaker to the selection signal for every loudspeaker as a header. Moreover, a formatter 80 adds as a header the acoustic signal identifier which shows the channel about the acoustic signal inputted into an input terminal 1 thru/or 6. The serial transmission of these selection signals, a selection-signal identifier, an acoustic signal, and the acoustic signal identifier is carried out, and they are supplied to each loudspeaker 81a thru/or 81f.

[0090] Each loudspeaker 81a thru/or 81f DEFOMATTA 85 take out the selection signal corresponding to the selection-signal identifier assigned to each loudspeaker, and outputs it to DEFOMATTA 86. DEFOMATTA 86 chooses the acoustic signal of the specified channel with a selection signal. Thereby, each loudspeaker can incorporate alternatively the acoustic signal inputted into the input terminal 1 of a formatter 80 thru/or 6.

[0091] After the acoustic signal chosen by DEFOMATTA 84 is returned to an analog signal by the D/A conversion circuit 87 and is amplified with amplifier 88, sound output of it is carried out from the output section 89.

[0092] A microcomputer 37 makes the sound based on [ in it / based on sequence in the time of a setup and connection decision of a loudspeaker ] a test signal in a case output from each loudspeaker with control and the selection signal of Selector SE. Other operations are the same as that of the gestalt of operation of drawing 7 .

[0093] Thus, also in the gestalt of this operation, the same effectiveness as the gestalt of operation of drawing 7 can be acquired.

[0094] Furthermore, to this invention, various combination is possible. For example, drawing 13 shows the example which built the selector in the loudspeaker using the substitution microphone. In drawing 13 , the same sign is given to the same component as drawing 4 and drawing 9 , and explanation is omitted.

[0095] In the example of drawing 13 , the acoustic signal from a selector 72 and the selection signal from a microcomputer 37 are supplied to loudspeaker 51a thru/or 51f through a cable 52. With a selection signal, the acoustic signal of six channels can be alternatively supplied to each loudspeaker 51a thru/or 51f.

[0096] Other configurations and operations are the same as that of the gestalt of operation of drawing 4 and drawing 9 .

[0097] Moreover, drawing 14 and drawing 15 are based on the combination of the gestalt of each above-mentioned implementation, and combine a location, a serial transmission, etc. of a channel selection circuit to the gestalt of operation of drawing 9 . In drawing 15 and drawing 16 , the same sign is given to the same component as each drawing of the gestalt of the above-mentioned implementation.

DEFOMATTA 100 is for carrying out deformatting of the format used on the occasion of transmission of the sound-collecting signal from loudspeaker 90a thru/or 90f. By one cable, the serial transmission of a formatter 62 or the output of 80 is carried out, and it is supplied to loudspeaker 90a thru/or 90f.

[0098] As shown in drawing 16 , it judges [ loudspeaker 90a thru/or 90f ] whether self-addressed data were transmitted by DEFOMATTA 91. DEFOMATTA 91 gives a self-addressed acoustic signal to the D/A conversion circuit 92, and changes it into an analog signal. After amplifying the output of the D/A conversion circuit 92 with amplifier 93, sound output is carried out from the output section 95 through a switch 94.

[0099] Moreover, when the sound which other loudspeakers outputted is collected by the output section 95, a sound-collecting signal is supplied to amplifier 96 from a switch 94. Amplifier 96 amplifies a sound-collecting signal, gives it to the A/D-conversion circuit 97, and the A/D-conversion circuit 97 is changed into a digital signal, and it outputs it to a formatter 98. A formatter 98 adds a self identifier to a digital sound-collecting signal, and transmits it to a cable.

[0100] In addition, deformation various by within the limits which does not deviate from the main point of a proposal besides the gestalt of each above-mentioned implementation is possible for this invention. For example, although the example of six DORUBI digital loudspeakers was explained, it can apply also to the other method and the number's of channels not being limited etc. is clear.

---

[Translation done.]



\* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

## DESCRIPTION OF DRAWINGS

---

### [Brief Description of the Drawings]

[Drawing 1] The block diagram showing the gestalt of 1 operation of the channel arrangement equipment concerning this invention.

[Drawing 2] The block diagram showing the internal configuration of the remote control 33 in drawing 1.

[Drawing 3] The flow chart for explaining actuation of the gestalt of operation of drawing 1.

[Drawing 4] The block diagram showing the gestalt of other operations of this invention.

[Drawing 5] The block diagram showing loudspeaker 51a in drawing 4 thru/or a 51f internal configuration.

[Drawing 6] The flow chart for explaining actuation of the gestalt of operation of drawing 4.

[Drawing 7] The block diagram showing the gestalt of other operations of this invention.

[Drawing 8] The block diagram showing loudspeaker 65a in drawing 7 thru/or a 65f internal configuration.

[Drawing 9] The block diagram showing the gestalt of other operations of this invention.

[Drawing 10] The flow chart for explaining actuation of the gestalt of operation of drawing 9.

[Drawing 11] The block diagram showing the gestalt of other operations of this invention.

[Drawing 12] The block diagram showing loudspeaker 81a in drawing 11 thru/or a 81f internal configuration.

[Drawing 13] The block diagram showing the gestalt of other operations of this invention.

[Drawing 14] The block diagram showing the gestalt of other operations of this invention.

[Drawing 15] The block diagram showing the gestalt of other operations of this invention.

[Drawing 16] The block diagram showing loudspeaker 90a in drawing 14 and drawing 15 thru/or a 90f internal configuration.

[Drawing 17] The block diagram showing the DVD audio system of the mold corresponding to DORUBI digital 5.1ch.

### [Description of Notations]

22a-22f [ -- Amplifier, 33 / -- Remote control, 34, or 36 / -- A microphone, 37 / -- A microcomputer, SE / -- Selector. ] -- A loudspeaker, 30 -- Sound-source equipment, 31 -- A channel selection circuitry, 32

---

[Translation done.]



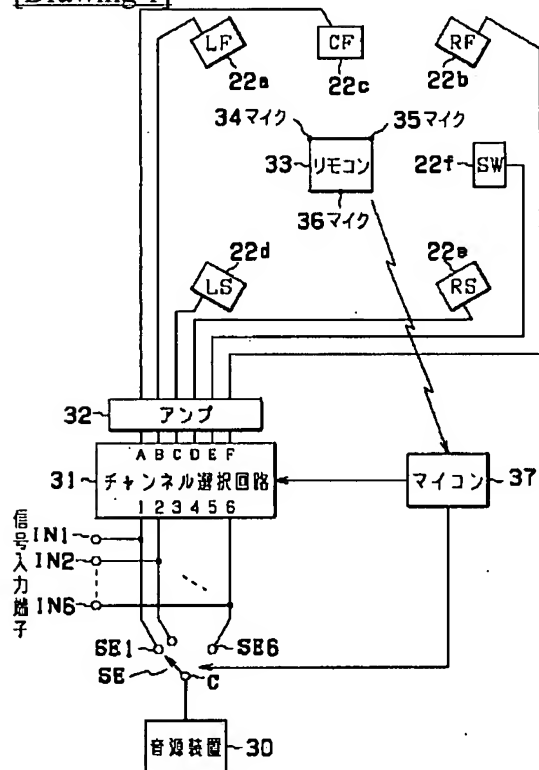
## \* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

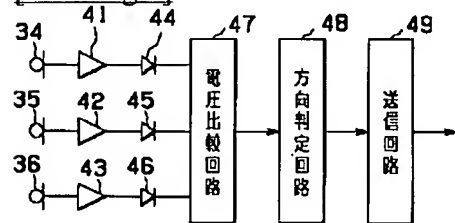
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

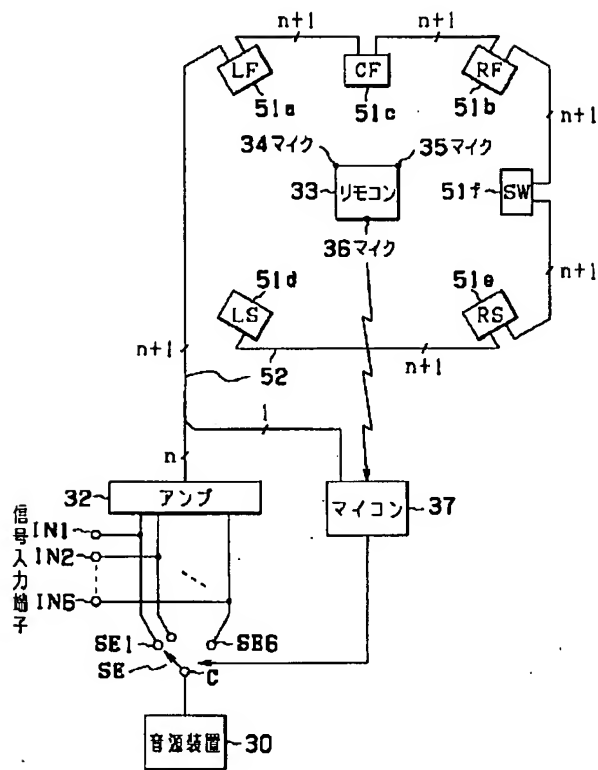
[Drawing 1]



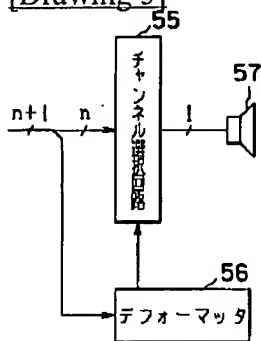
[Drawing 2]



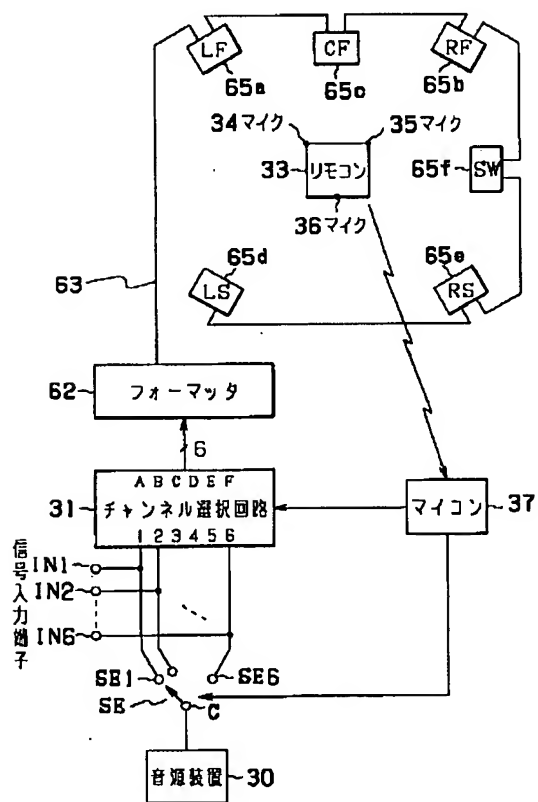
[Drawing 4]



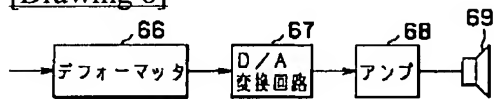
[Drawing 5]



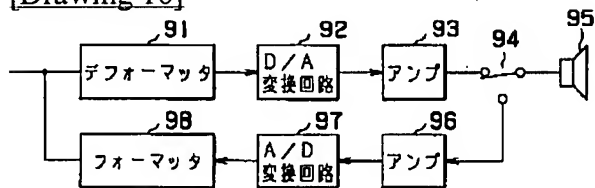
[Drawing 7]



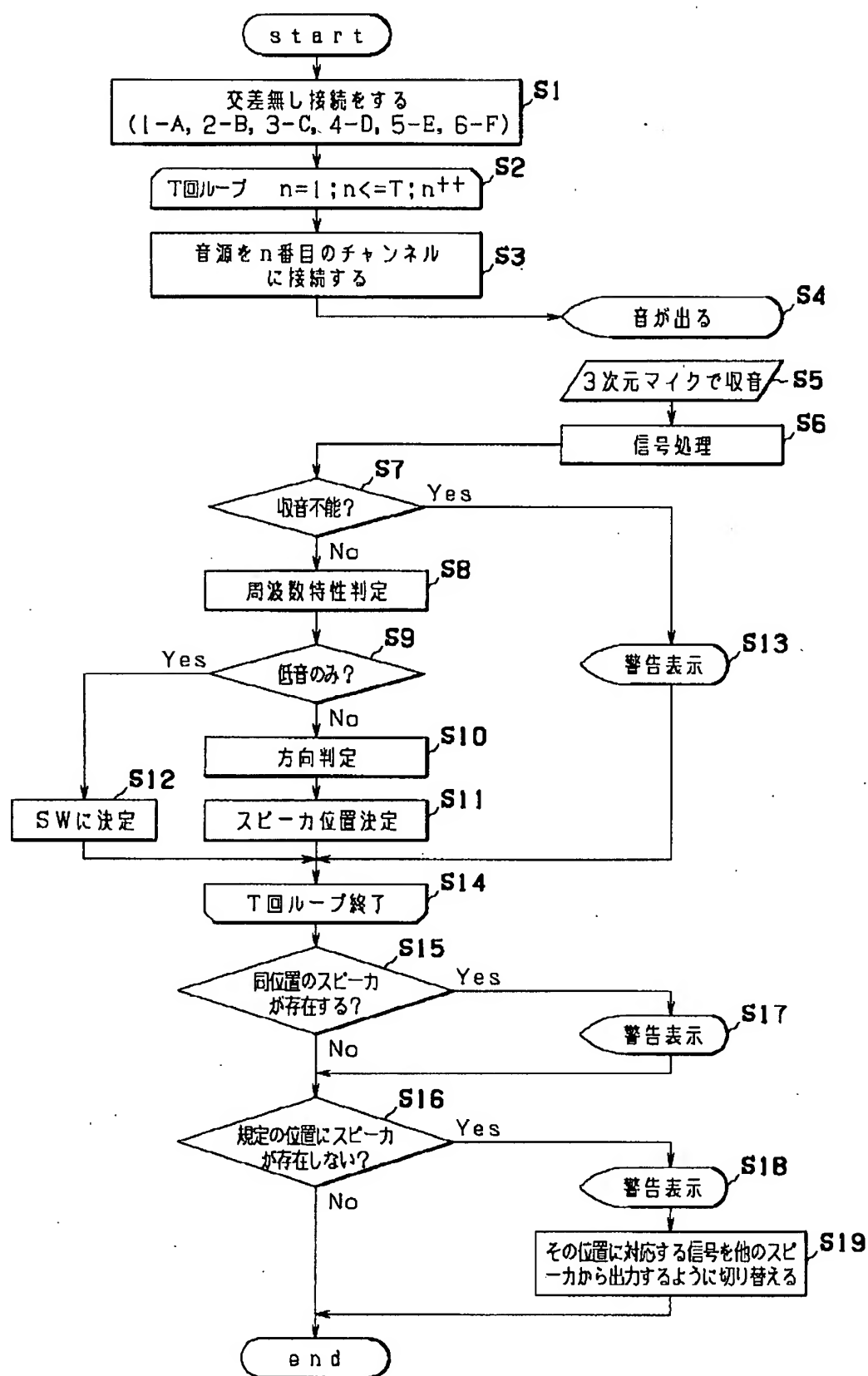
[Drawing 8]



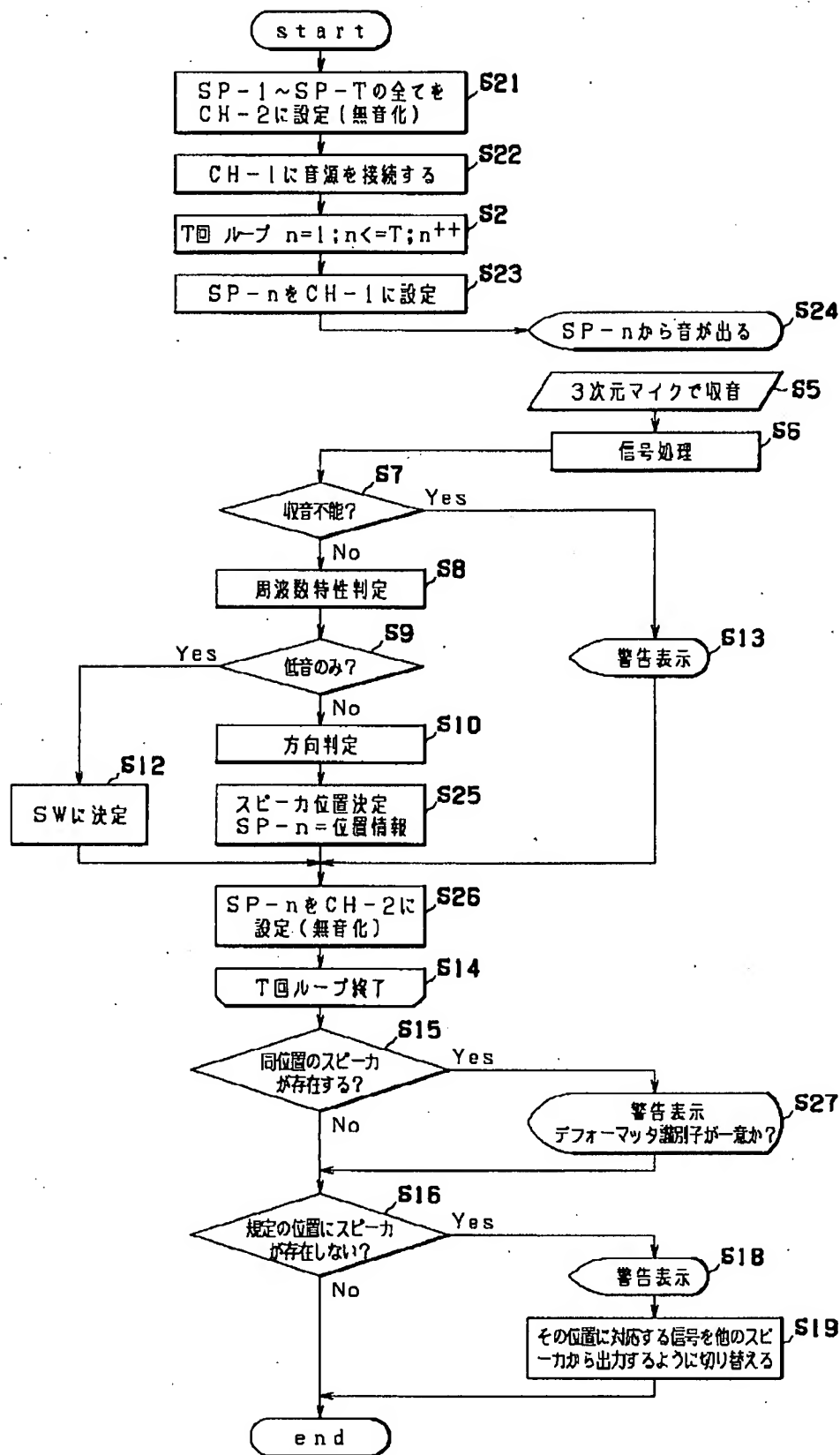
[Drawing 16]



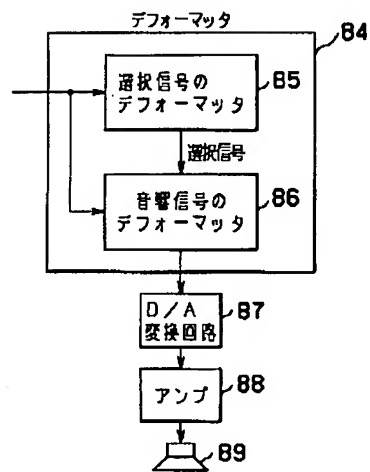
[Drawing 3]



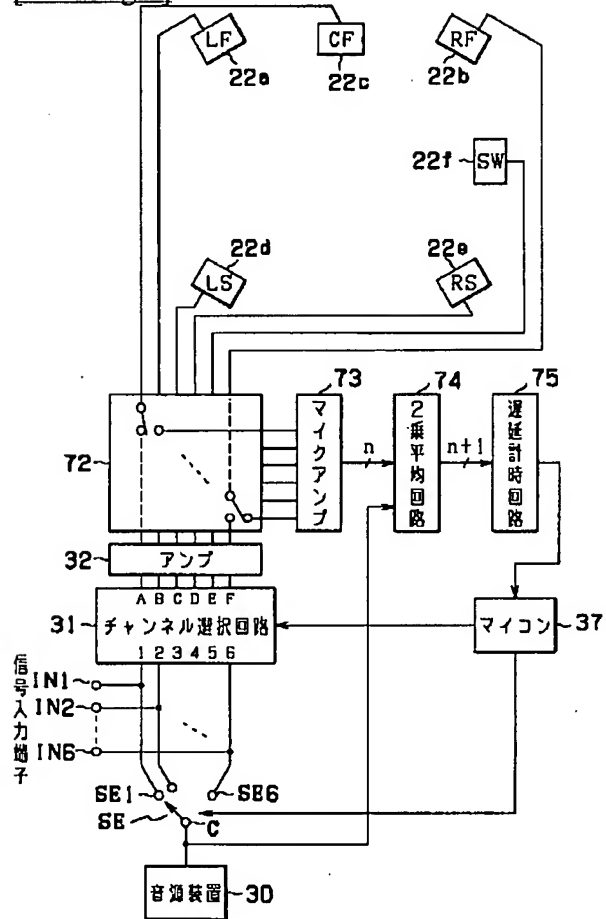
[Drawing 6]



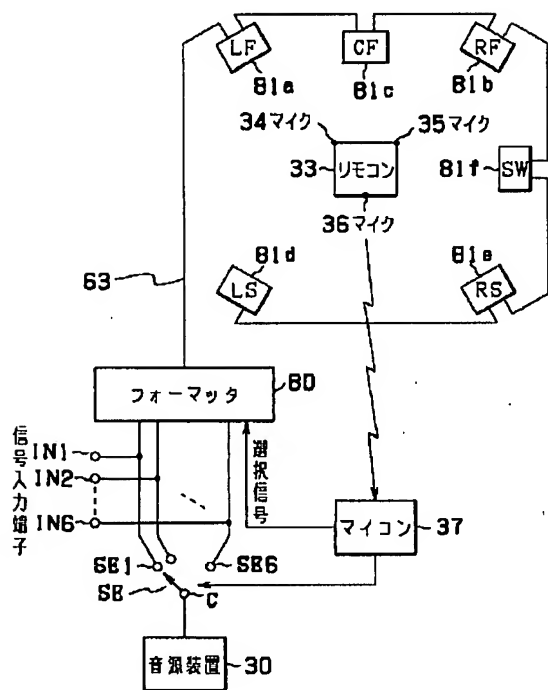
[Drawing 12]



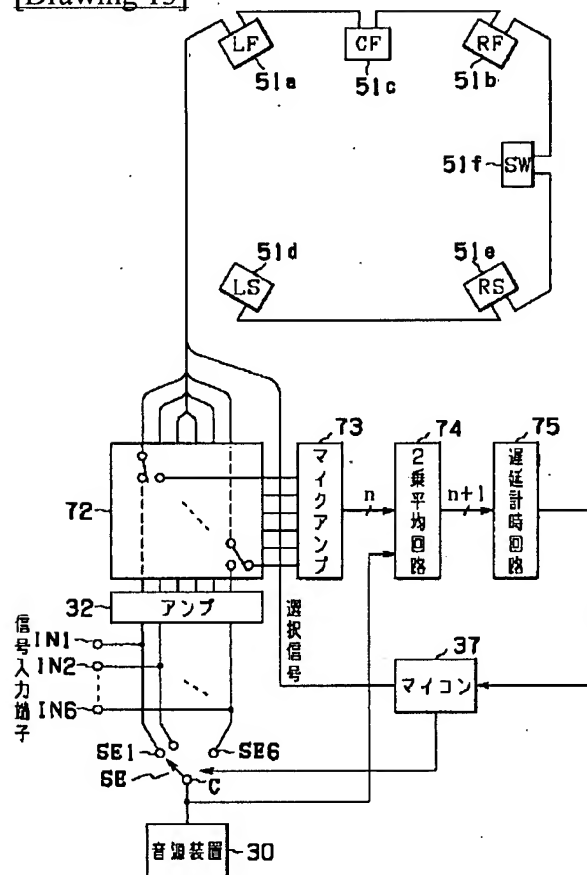
[Drawing 9]



[Drawing 11]

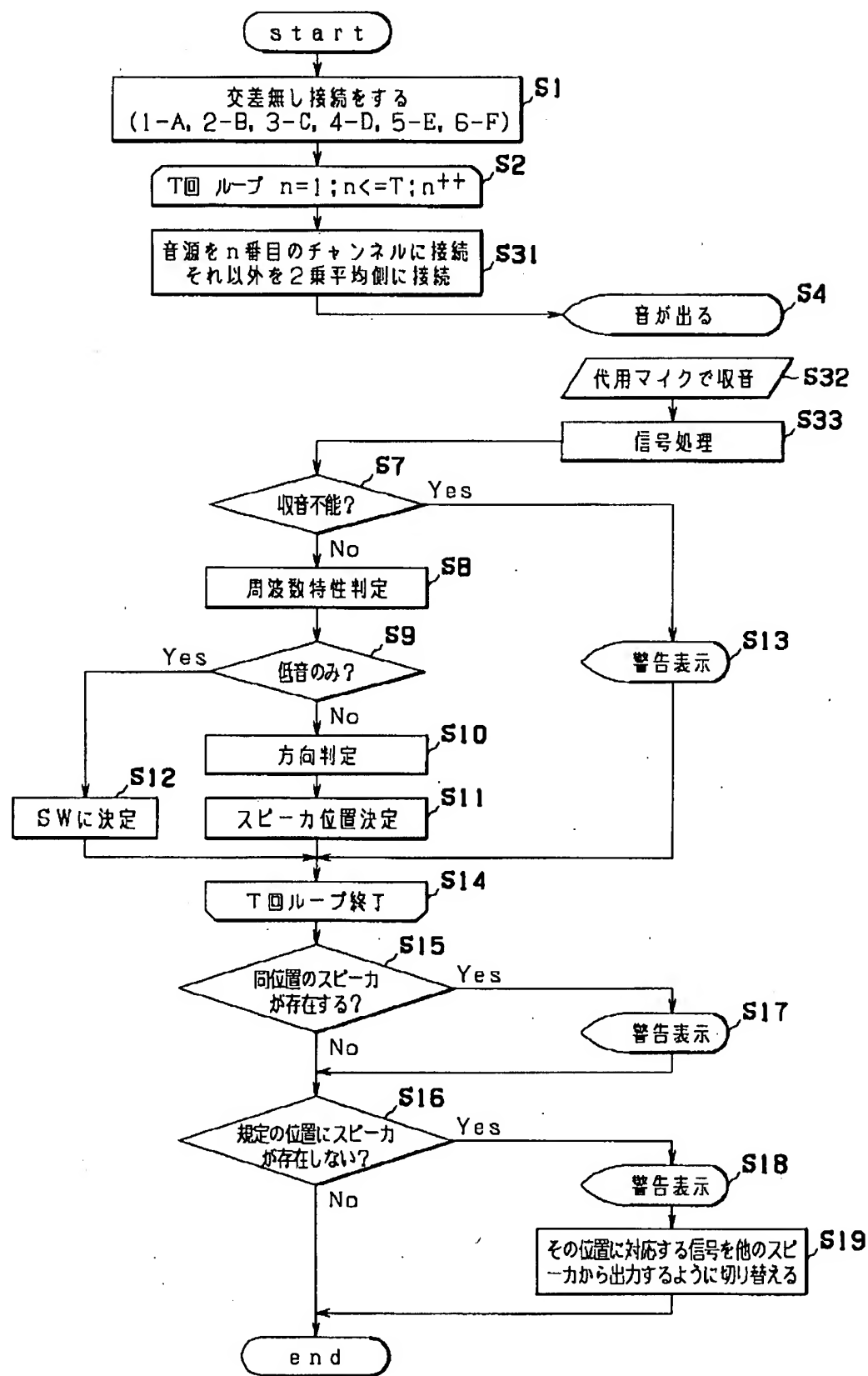


[Drawing 13]

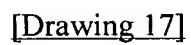
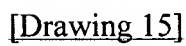


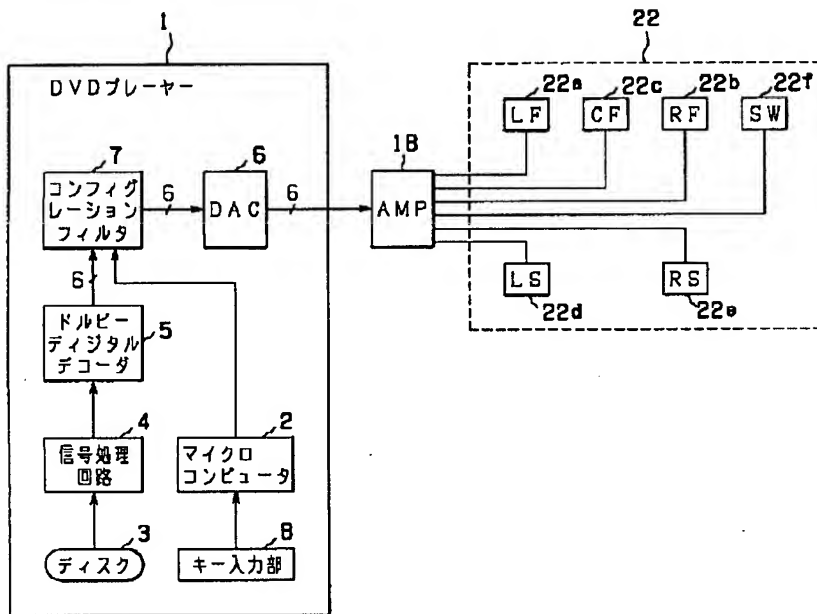
[Drawing 10]





[Drawing 14]





[Translation done.]